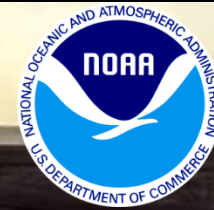


National Weather Service Milwaukee

Spotter Training Class 2017

#skywarn17

Video: Skip Talbot



What is a storm spotter?

The National Weather Service needs reports of **tornadoes**, **flash flooding**, **wind damage**, and **hail size** to effectively warn the public of inclement weather.



Storm Spotter volunteers provide ground truth to what NWS meteorologists interpret on radar. They typically have an interest in the weather and a desire to serve their community.



National Weather Service Milwaukee/Sullivan

Who are storm spotters?



- Law enforcement
- Fire personnel
- EMS workers
- Public utility
- Amateur Radio volunteers
- Private citizens

(Hospitals, schools, churches, nursing homes, others w/responsibility for protecting others.)



National Weather Service Milwaukee/Sullivan

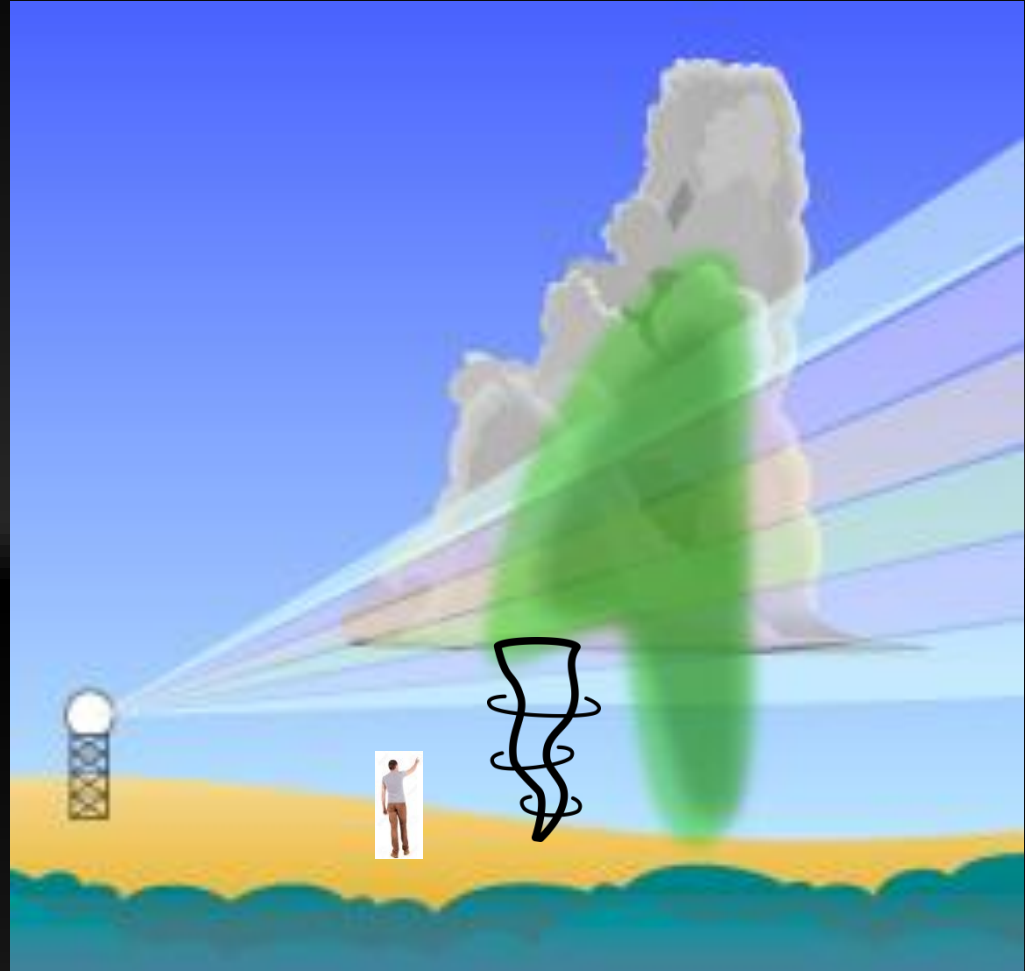
Radar Limitations



NWS Milwaukee Doppler Radar

Spotters provide
“Ground Truth”.

Radar typically
doesn't ‘see’
tornado.



National Weather Service Milwaukee/Sullivan

How do spotters help?

SEVERE WEATHER STATEMENT
NATIONAL WEATHER SERVICE MILWAUKEE/SULLIVAN WI
531 PM CDT THU AUG 18 2005

WIC021-025-049-111-182315-
/O.CON.KMKX.TO.W.0029.000000T0000Z-050818T2315Z/
COLUMBIA-SAUKEE-IOWA-DANE-
531 PM CDT THU AUG 18 2005

...A TORNADO WARNING CONTINUES UNTIL 615 PM CDT FOR DANE...IOWA...
SAUK AND COLUMBIA COUNTIES...

AT 527 PM CDT...**TRAINED WEATHER SPOTTERS** REPORTED A LINE OF TORNADO
PRODUCING STORMS. THESE TORNADO PRODUCING STORMS WERE LOCATED ALONG
A LINE EXTENDING FROM 6 MILES NORTH OF BARABOO TO NEAR SPRING
GREEN...MOVING EAST AT 50 MPH.

TORNADO PRODUCING STORMS WILL BE NEAR...
MIDDLETON...LODI AND DANE BY 540 PM CDT...
WAUNAKEE...SHOREWOOD HILLS...POYNETTE AND MADISON BY 545 PM CDT...
TOKEN CREEK...MORRISONVILLE AND WINDSOR BY 550 PM CDT...

**TRAINED SPOTTERS REPORTED A TORNADO NEAR SPRING GREEN AT 525
PM...AND ANOTHER TORNADO NEAR COUNTY HIGHWAY C IN SAUK COUNTY...EAST
OF LELAND.**

DO NOT USE YOUR CAR TO TRY TO OUTRUN A TORNADO. CARS ARE EASILY
TOSSED AROUND BY TORNADO WINDS. IF YOU ARE CAUGHT IN THE PATH OF A
TORNADO...LEAVE THE CAR AND GO TO A STRONG BUILDING. IF NO SAFE
STRUCTURE IS NEARBY...SEEK SHELTER IN A DITCH OR LOW SPOT AND COVER
YOUR HEAD.

A TORNADO WATCH REMAINS IN EFFECT UNTIL 900 PM CDT THURSDAY EVENING
FOR SOUTH CENTRAL WISCONSIN.

LAT...LON 4351 8999 4316 9009 4297 8901 4334 8903

\$\$

SEVERE WEATHER STATEMENT
NATIONAL WEATHER SERVICE MILWAUKEE/SULLIVAN WI
620 PM CDT THU AUG 18 2005

WIC021-025-182345-
/O.CON.KMKX.TO.W.0031.000000T0000Z-050818T2345Z/
COLUMBIA-DANE-
620 PM CDT THU AUG 18 2005

...A TORNADO WARNING CONTINUES UNTIL 645 PM CDT FOR DANE AND COLUMBIA
COUNTIES...

AT 615 PM CDT...**TRAINED WEATHER SPOTTERS** REPORTED A TORNADO. THIS
TORNADO WAS LOCATED IN FITCHBURG...MOVING EAST NORTHEAST AT 30 MPH.

THE TORNADO WILL BE NEAR...
MONONA BY 635 PM CDT...

**AT 622 PM CDT...HAMS REPORTED A TORNADO 3 NORTH OF DANE...AND
ANOTHER TORNADO 3 MILES NORTH OF LODI. THESE TORNADOES WERE MOVING
EAST-NORTHEAST. DEFOREST IS IN THE PATH OF THE DANE TORNADO.**

A TORNADO WATCH REMAINS IN EFFECT UNTIL 900 PM CDT THURSDAY EVENING
FOR SOUTH CENTRAL WISCONSIN. A TORNADO WATCH ALSO REMAINS IN EFFECT
UNTIL 1100 PM CDT THURSDAY EVENING FOR SOUTHEASTERN WISCONSIN.

LAT...LON 4342 8958 4312 8962 4310 8902 4342 8900

\$\$

People react to reports of tornadoes!



National Weather Service Milwaukee/Sullivan

Real Time Reports

Reports that come in as the storm is **in progress** are much more valuable than post-storm reports.

NWS relays this information through warnings.

Broadcast media can relay over the air.



People react!



National Weather Service Milwaukee/Sullivan

What triggers a warning?



Environment



Radar

Typically need
2 out of 3 of
these to issue
a warning.



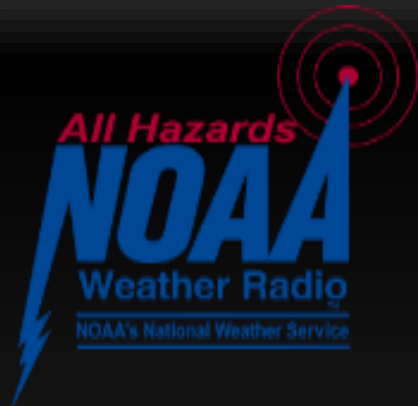
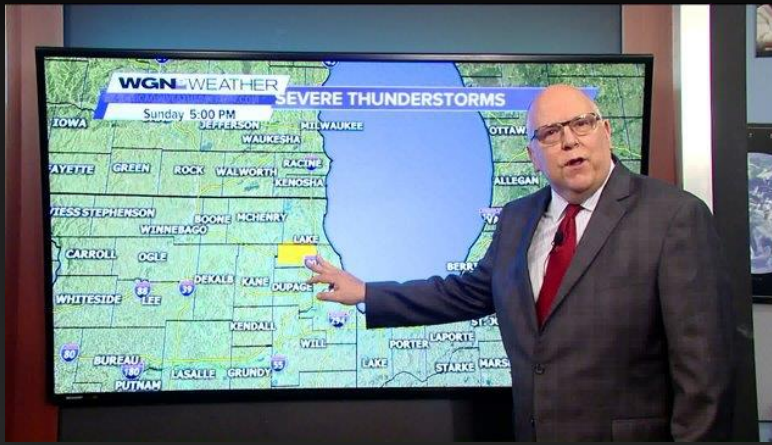
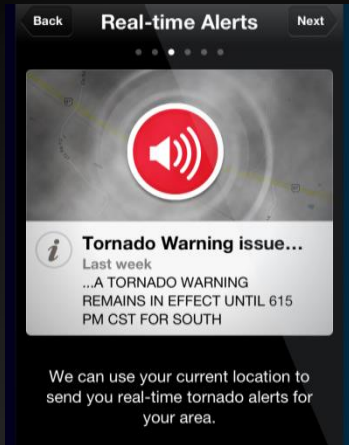
Report

Less reliant on
spotter reports
at night.



National Weather Service Milwaukee/Sullivan

How do spotters help?

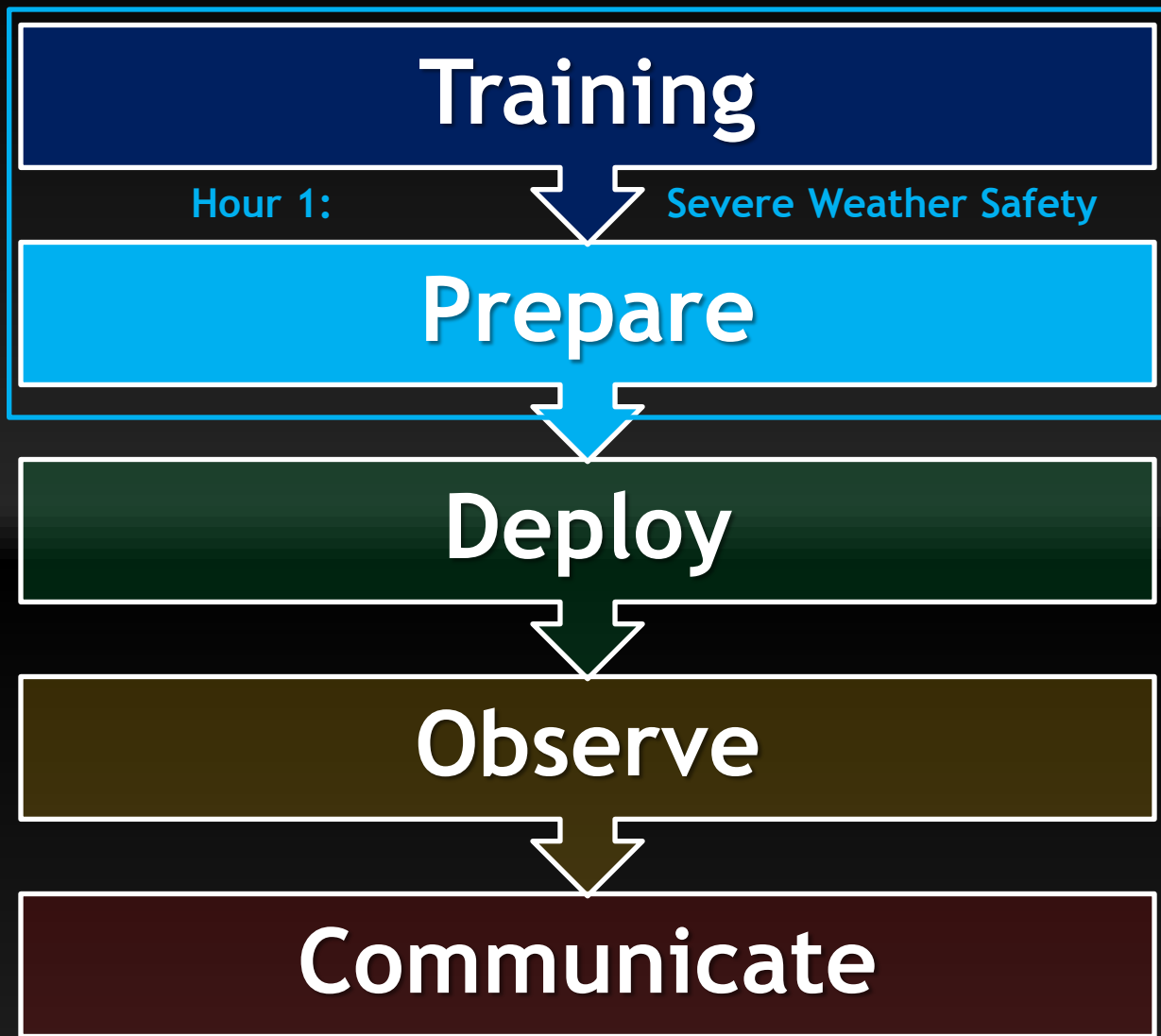


Your report could be the reason the NWS issues a
Tornado Warning & someone seeks shelter.



National Weather Service Milwaukee/Sullivan

Storm Spotting Process



National Weather Service Milwaukee/Sullivan

Storm Spotting Process

Training

Prepare

Deploy

Observe

Communicate



National Weather Service Milwaukee/Sullivan

Storm Spotting Process

Training

Prepare

Deploy

Observe

Communicate



National Weather Service Milwaukee/Sullivan

Deploy

When should you go out to look at storms?

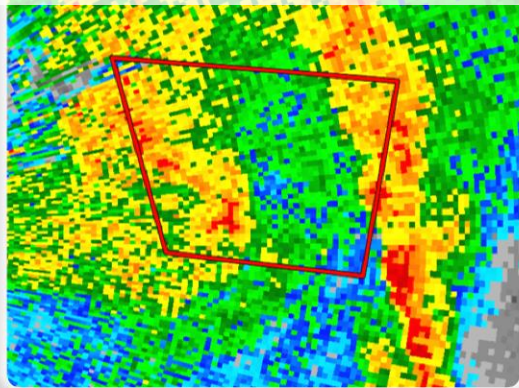
Watch Issued?



Too Early?



Warning Issued?



Too Late?



National Weather Service Milwaukee/Sullivan

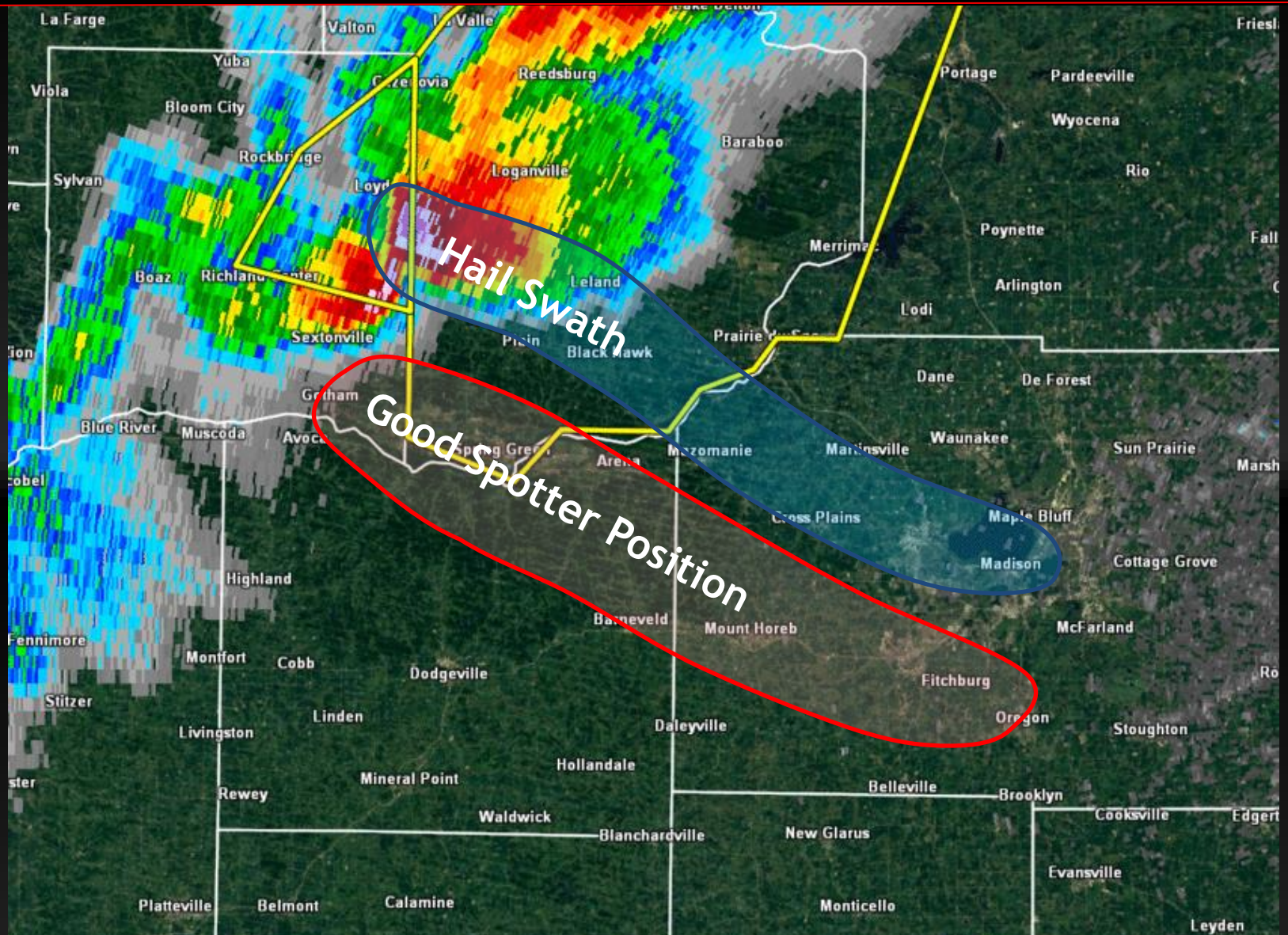
Spotting Locations

- Stationary or Mobile.
- Upstream from city.
- Good visibility.
 - High Ground.
 - No trees.
- Escape routes.



National Weather Service Milwaukee/Sullivan

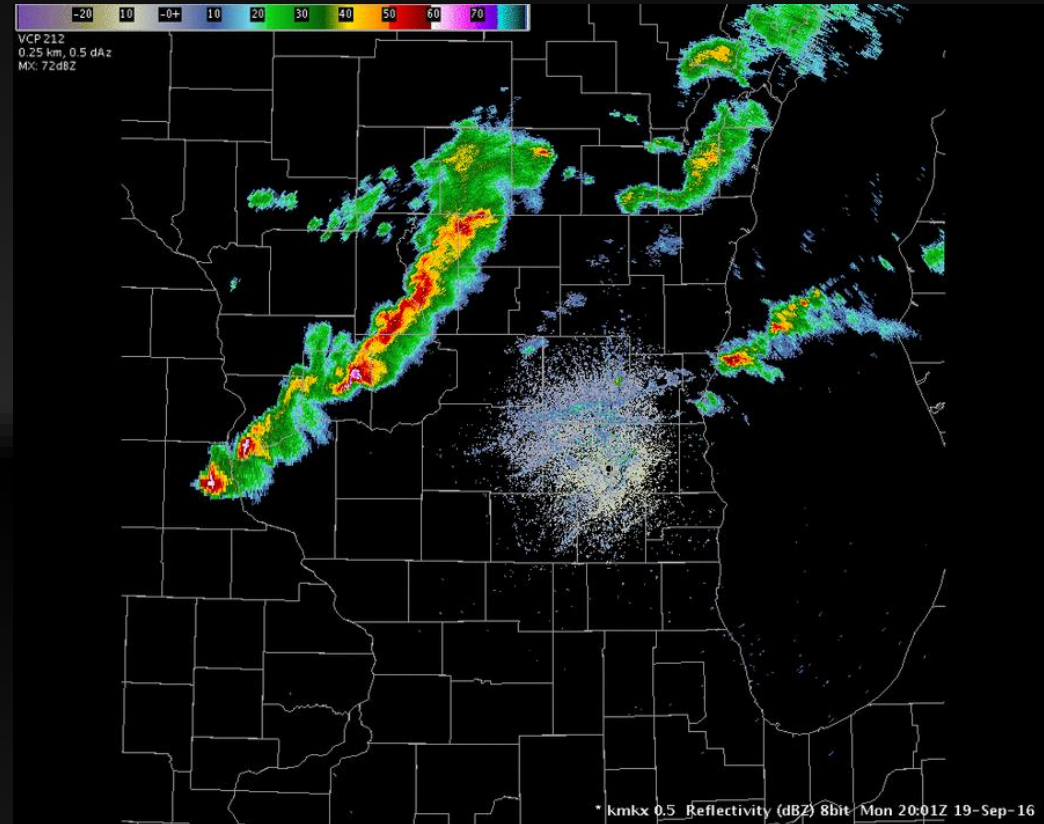
September 19th, 2016 Supercell



National Weather Service Milwaukee/Sullivan

Self Activating

- Stay ahead of storms.
- Monitor conditions in nearby counties.
- Monitor radar trends.
- Be pro-active!
- May not see anything.



National Weather Service Milwaukee/Sullivan

Doppler Radar

RADIo Detection And Ranging



- Prototype radar built in 1988
- Weather Surveillance Radar-1988 Doppler (WSR-88D)



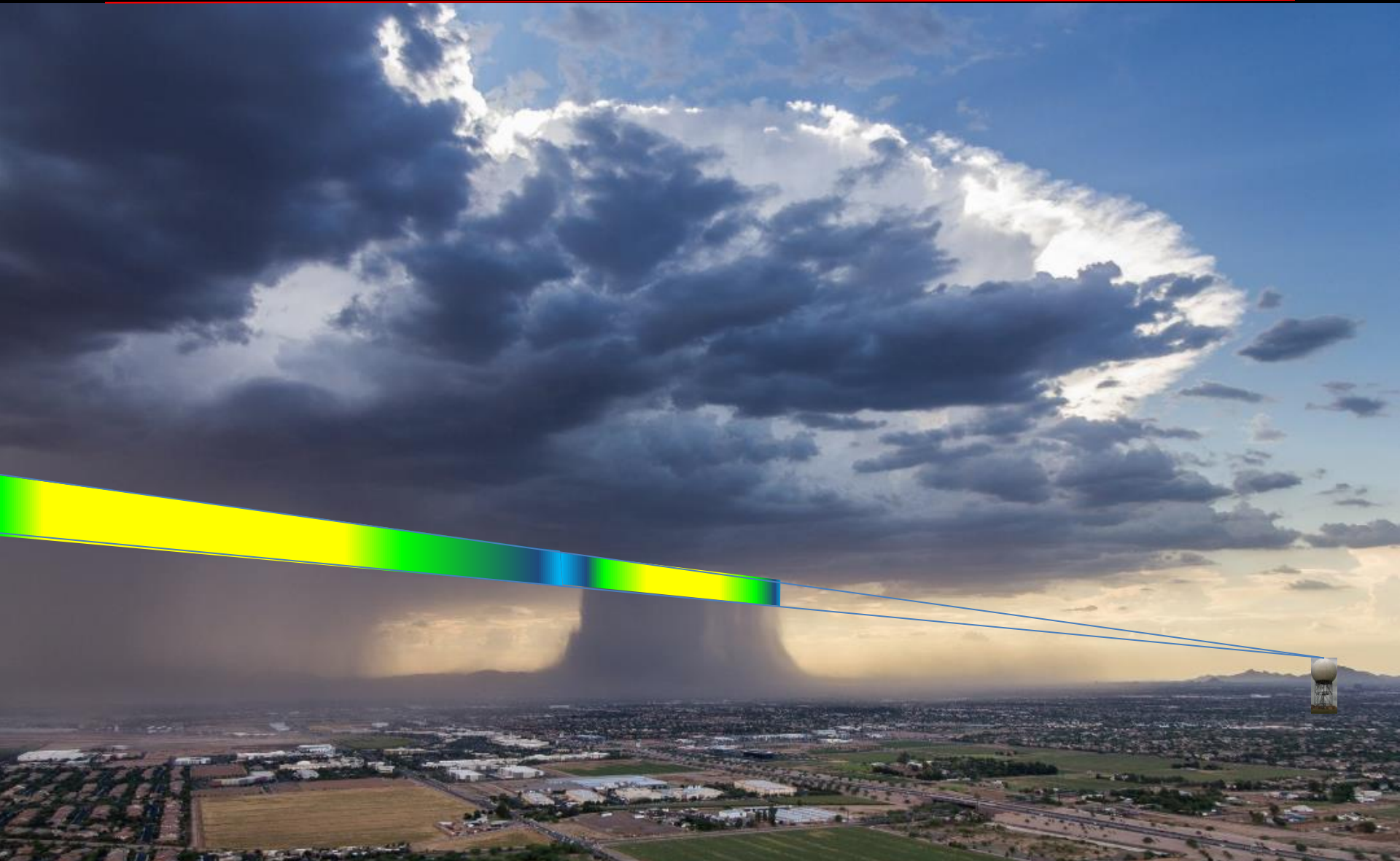
National Weather Service Milwaukee/Sullivan

What you see...



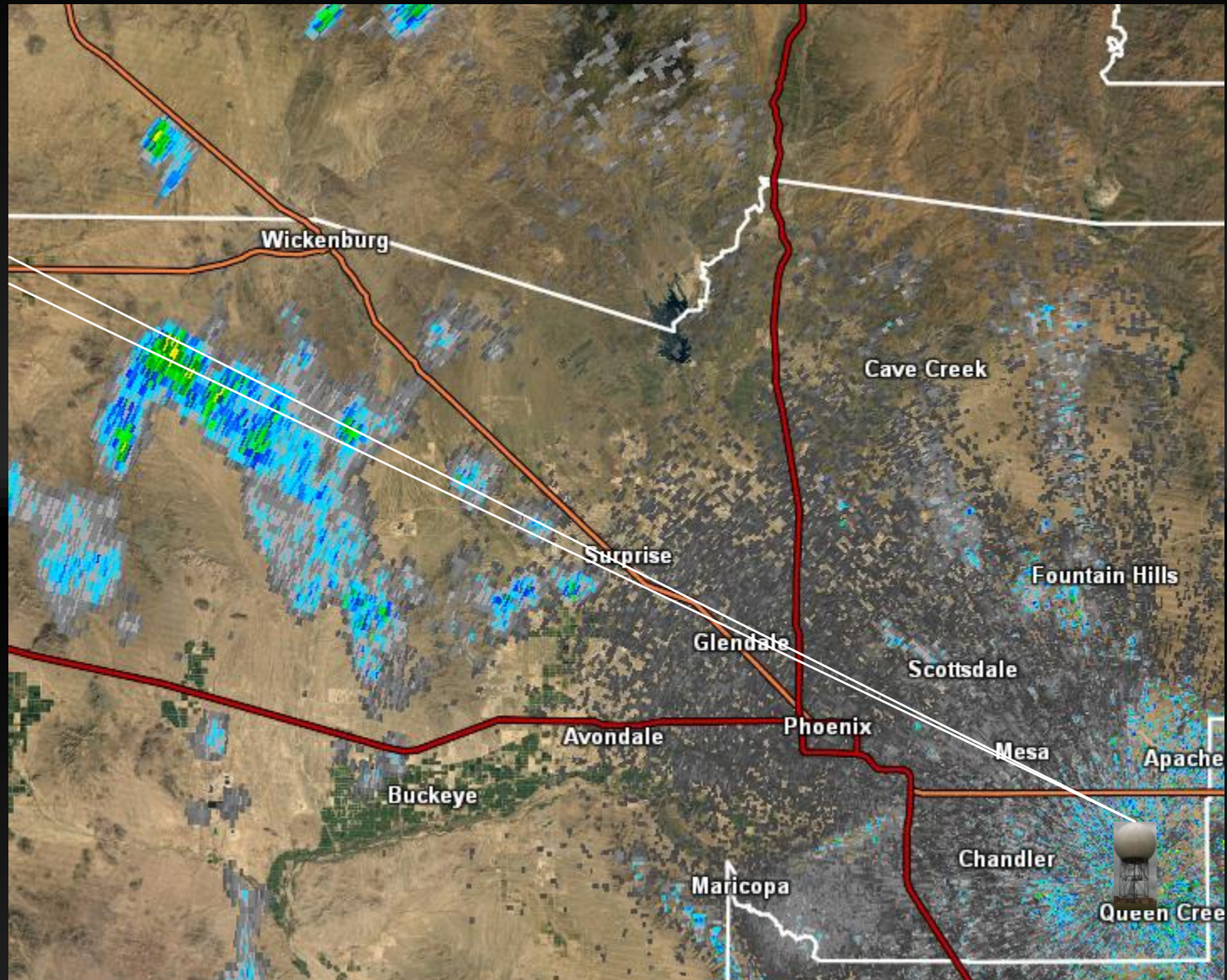
National Weather Service Milwaukee/Sullivan

What radar “sees”...



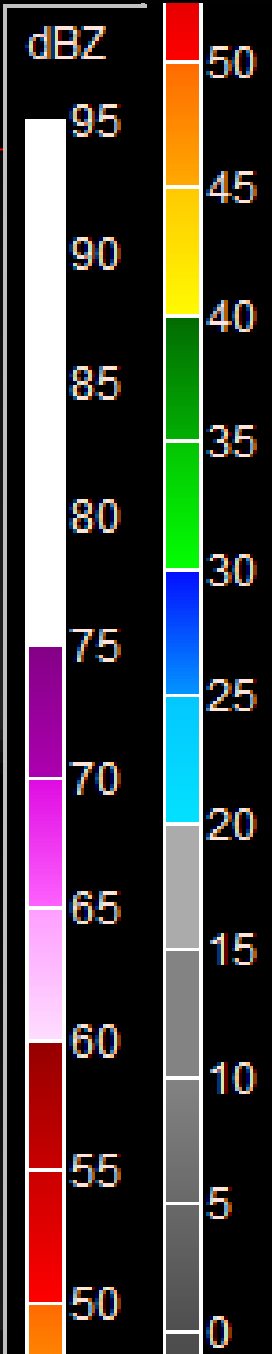
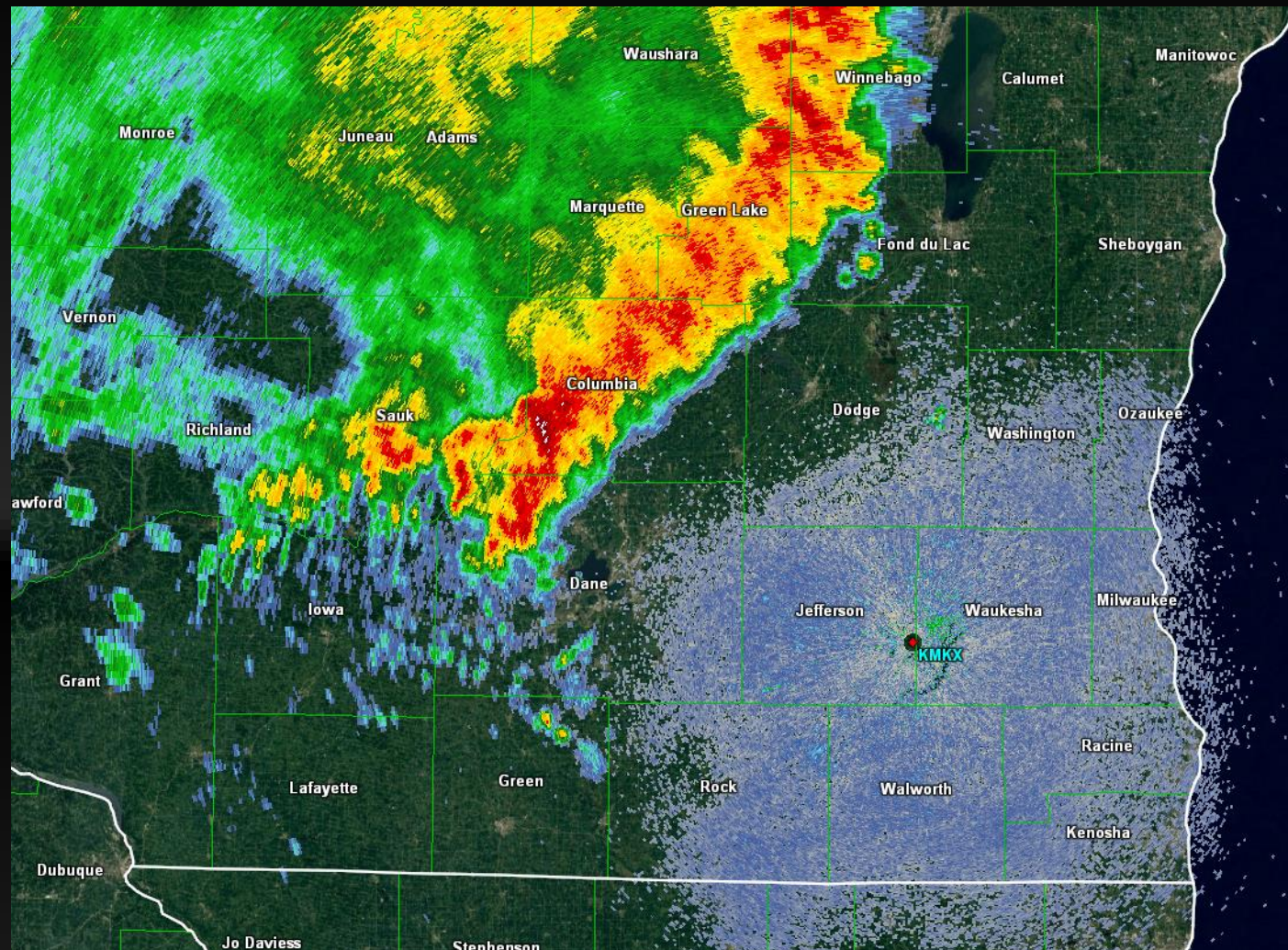
National Weather Service Milwaukee/Sullivan

What radar “sees”...



National Weather Service Milwaukee/Sullivan

Reflectivity



Check the scale you're using.
Higher reflectivity(dBZ) = More rain drops/hail

National Weather Service Milwaukee/Sullivan



Doppler Effect-Velocity



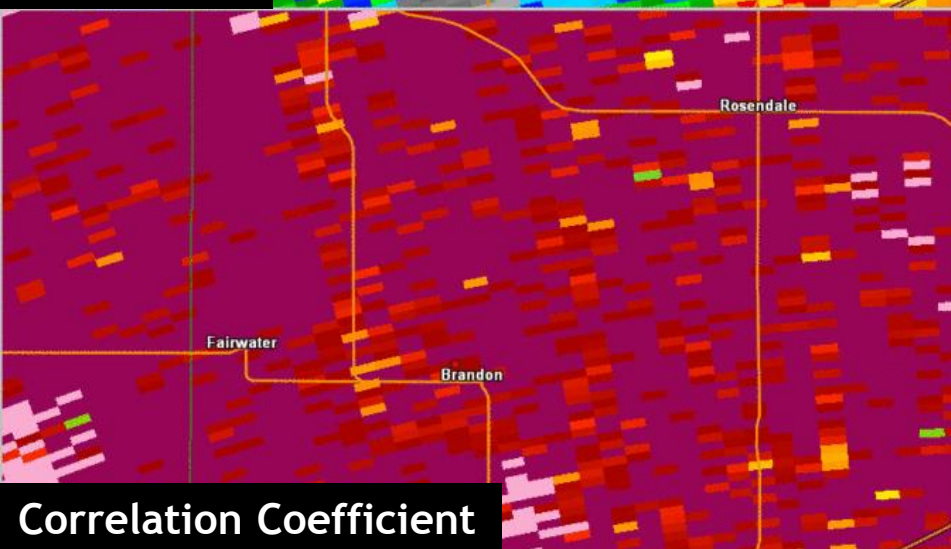
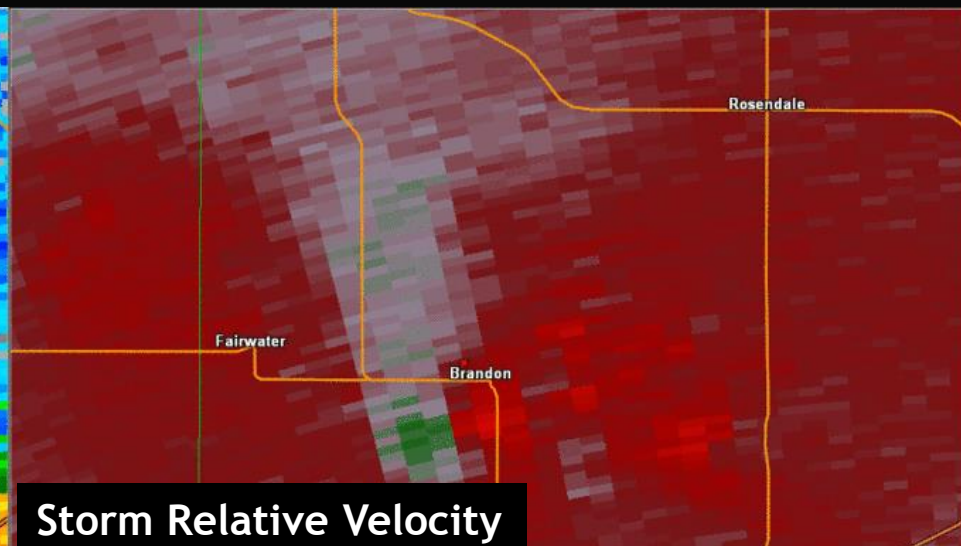
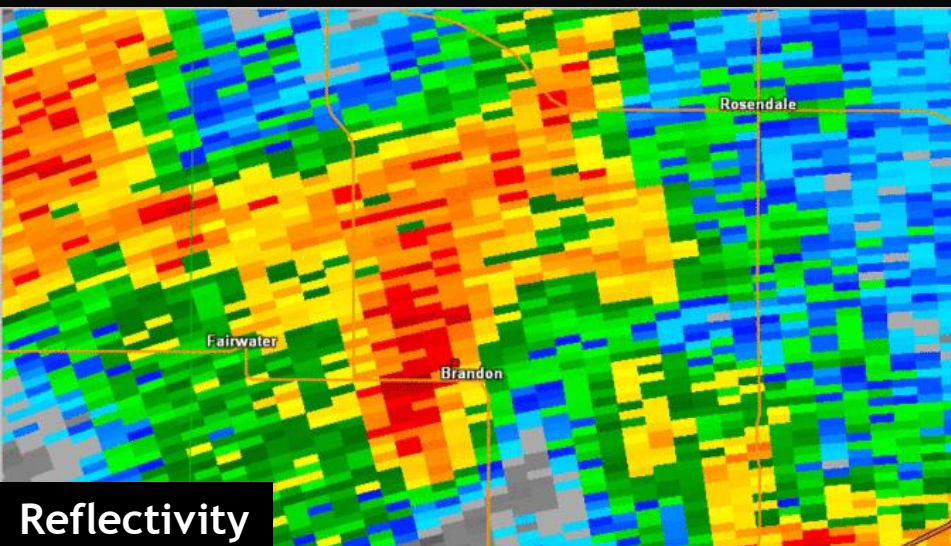
Red: Moving away from radar

Green: Moving toward radar



National Weather Service Milwaukee/Sullivan

Tornado Debris Signature



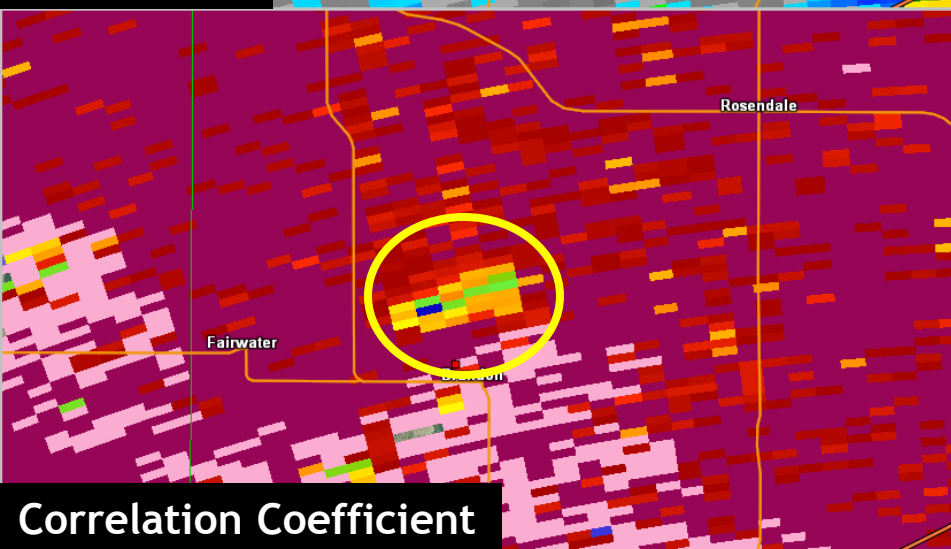
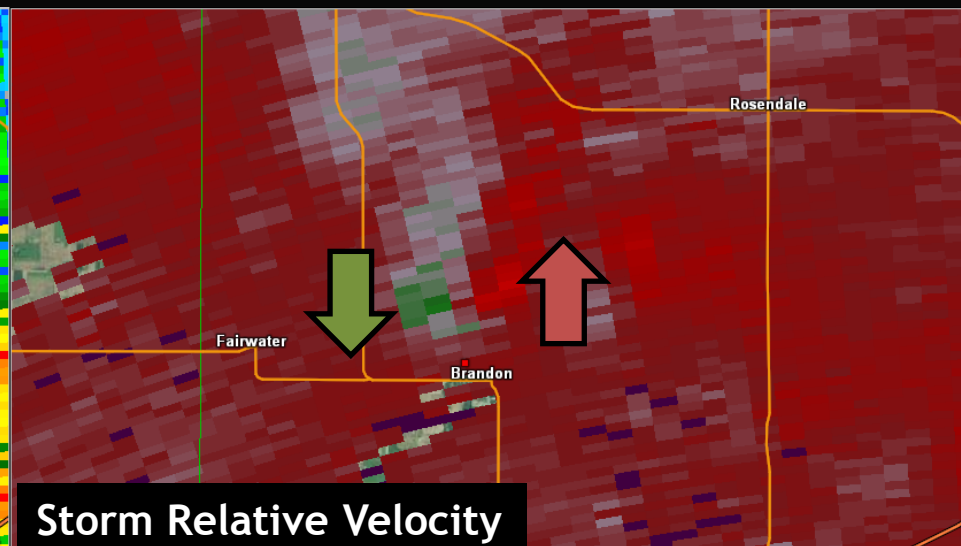
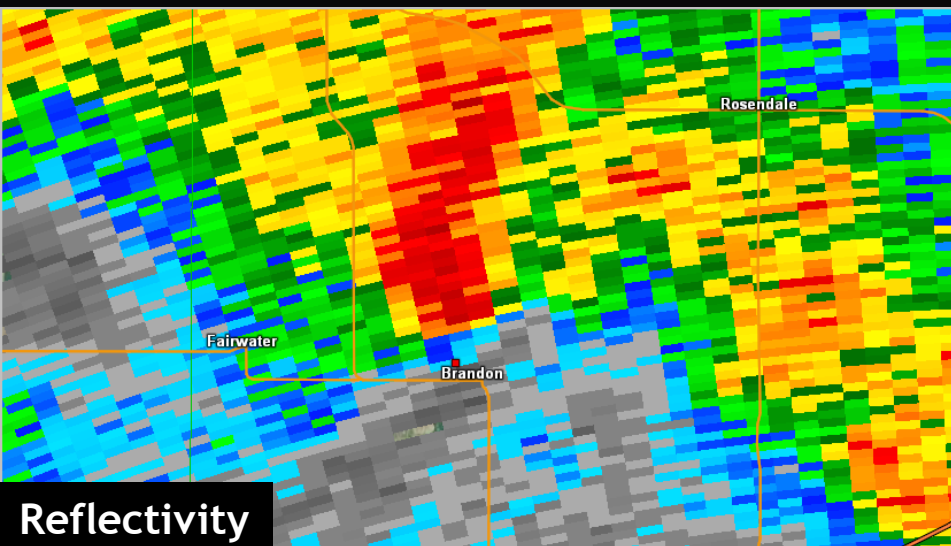
Storm Relative Velocity

Brandon (FDL County) EF1 Tornado
May 27, 2016



National Weather Service Milwaukee/Sullivan

Tornado Debris Signature



Storm Relative Velocity

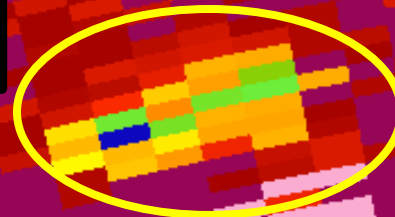
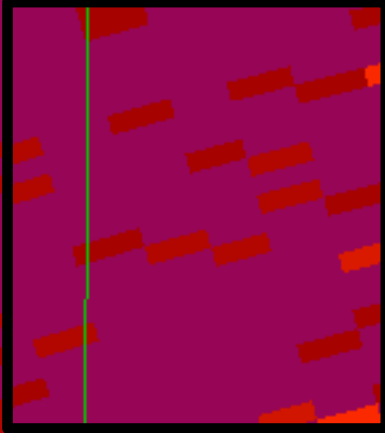
Brandon (FDL County) EF1 Tornado
May 27, 2016



National Weather Service Milwaukee/Sullivan

Correlation Coefficient

100% (or 1) the same shape/size



50-90% : Not same shape/size



Not Brandon Tornado



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Storm Spotting Process

Training

Prepare

Deploy

Observe

Communicate



National Weather Service Milwaukee/Sullivan

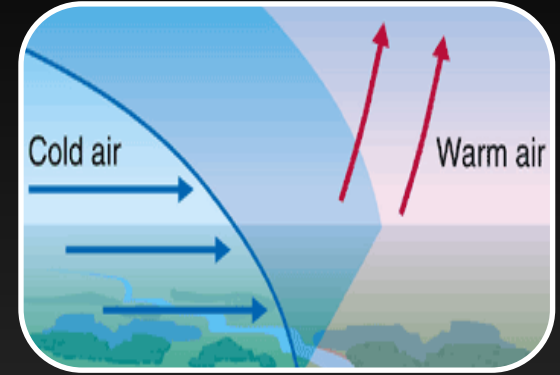
Thunderstorm Ingredients



Moisture

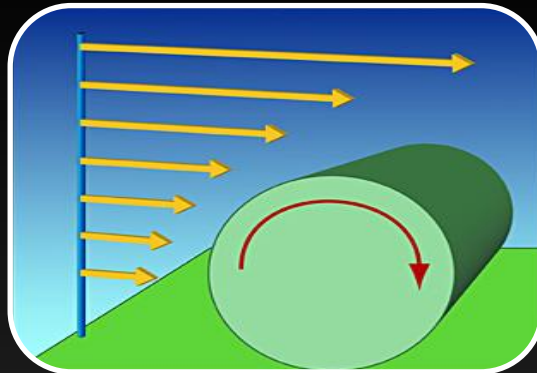


Instability



Lift

**BONUS:
For Severe Weather**



Wind Shear



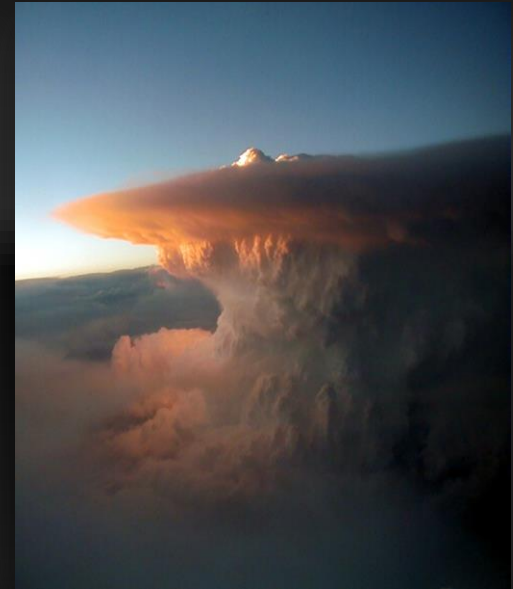
National Weather Service Milwaukee/Sullivan

Storm Types and Features

Single
Cell

Multicell Cluster
or Line

Supercell



Little to none.

Low

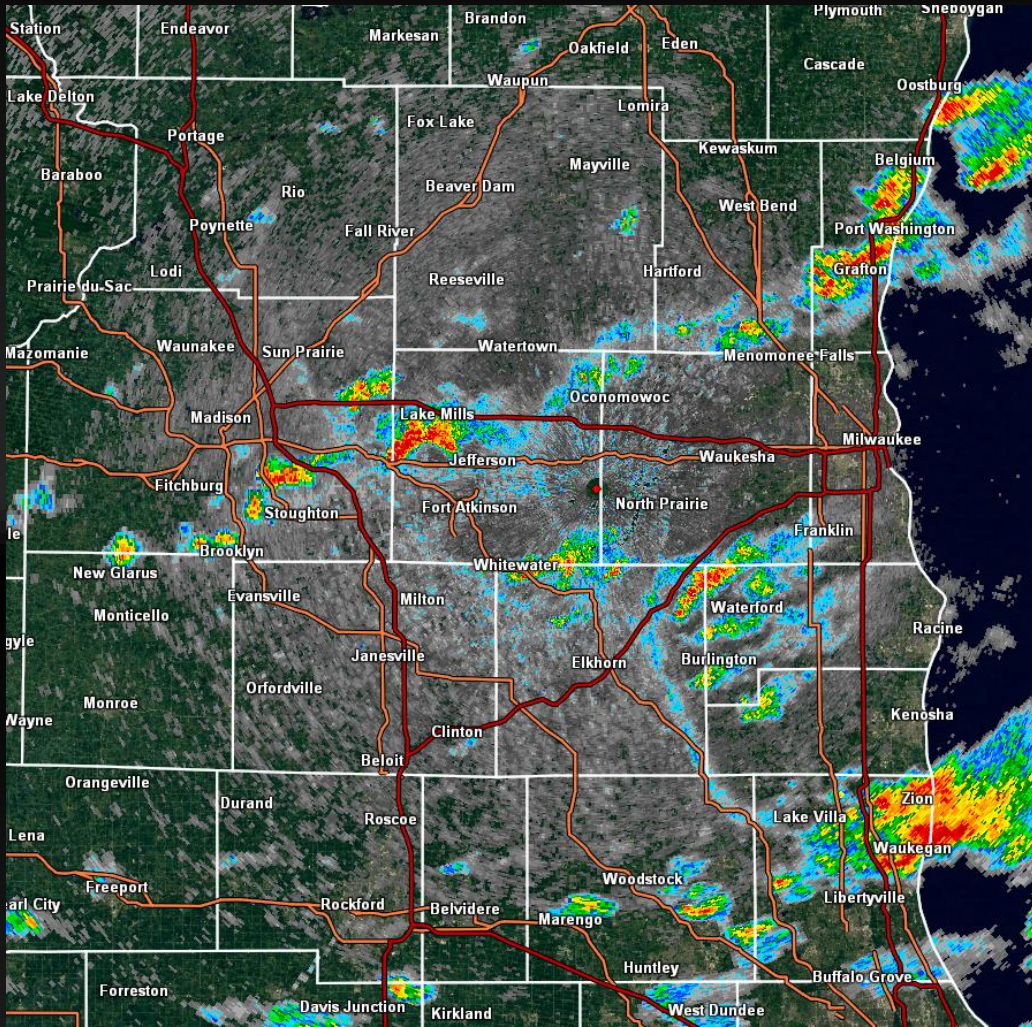
Higher

WIND SHEAR



National Weather Service Milwaukee/Sullivan

Single Cell Storms

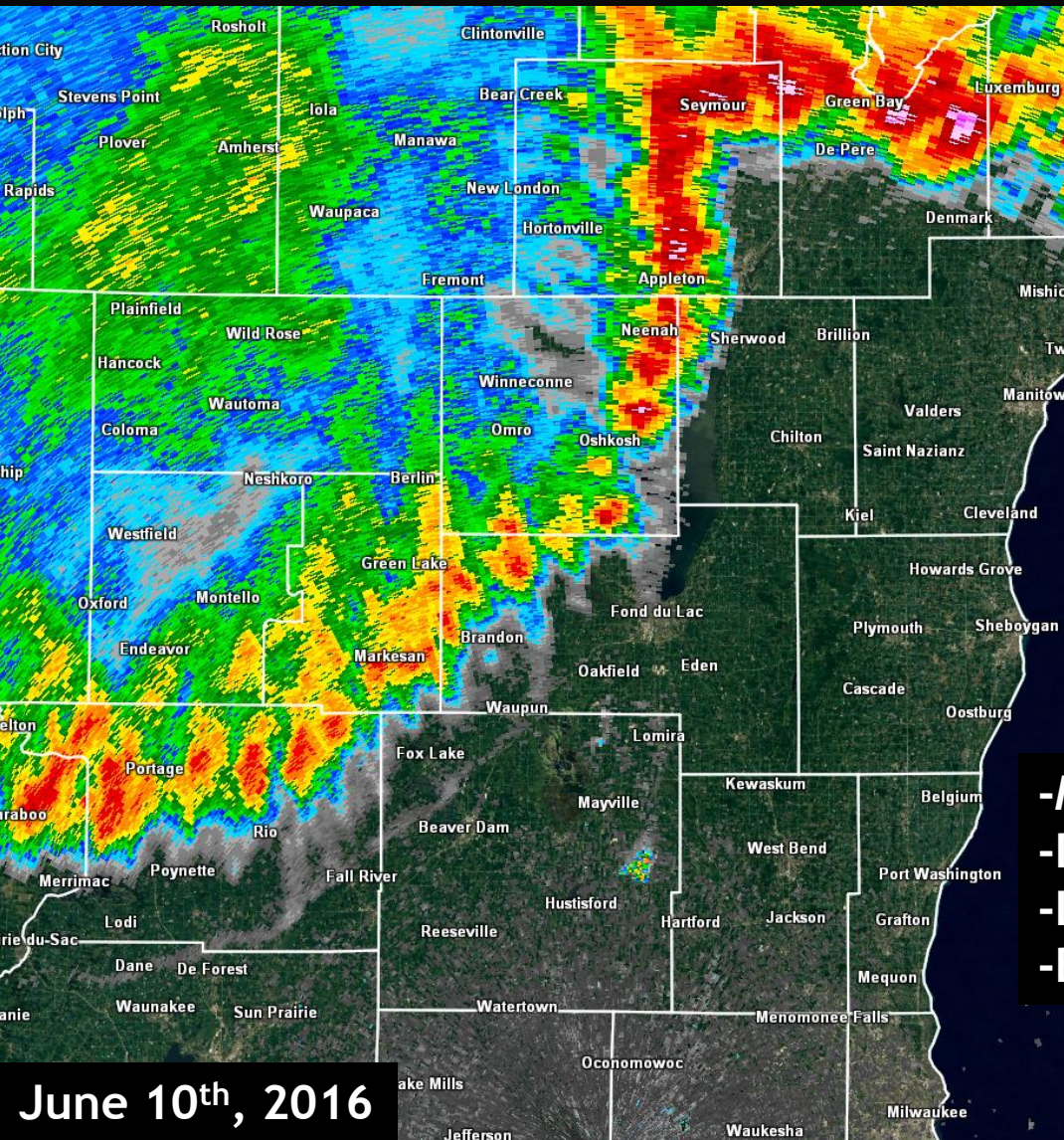


- Short lived. (30-45 min)
- Little, if any, severe weather.
- Small hail.
- Gusty winds. (<70mph)
- Brief, weak tornadoes possible.



National Weather Service Milwaukee/Sullivan

Multicell Cluster/Squall Line Storms



Fond du Lac
Walleye Weekend
Doug Raflik

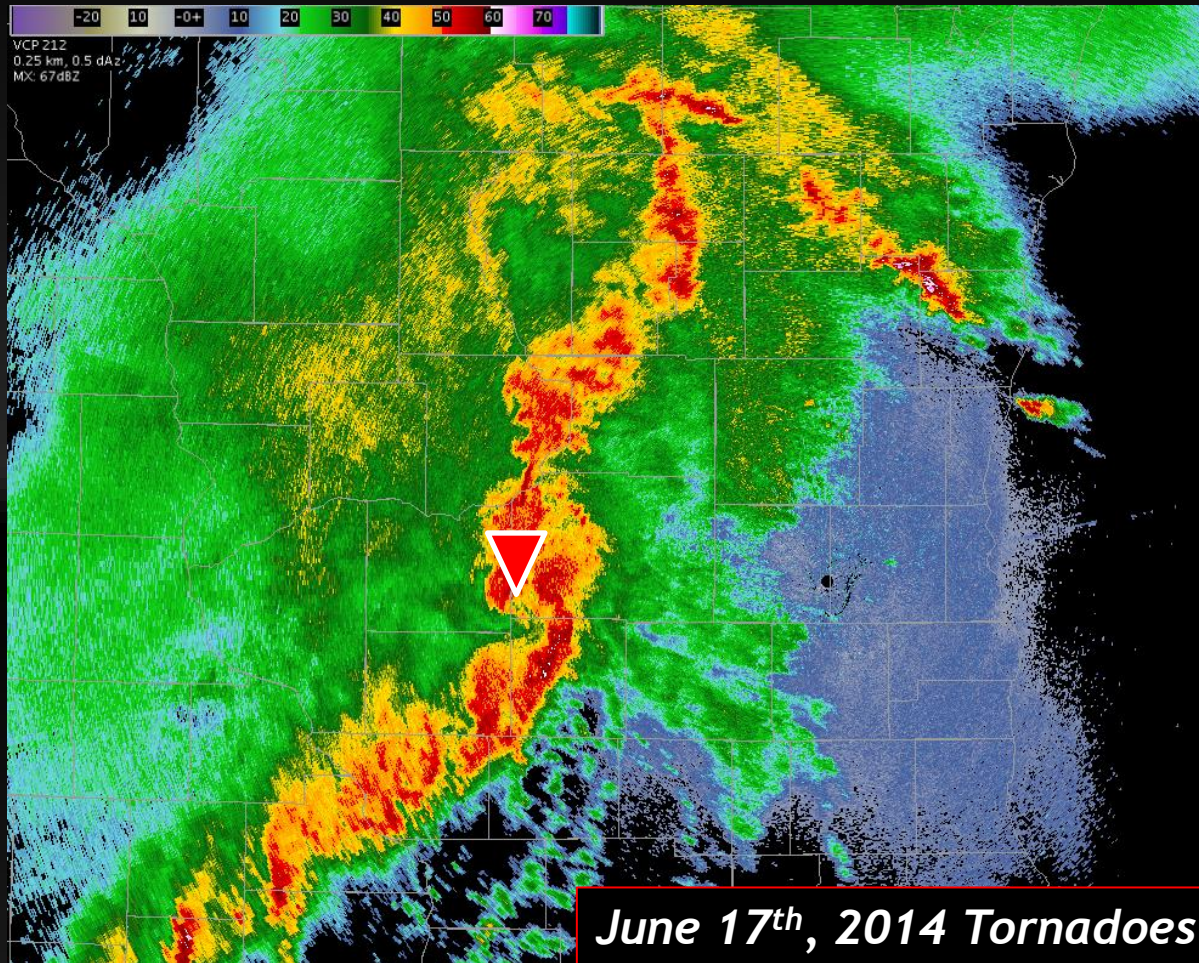
- Most common severe weather.
- Damaging winds. (Downburst)
- Large hail. (Small-Moderate)
- Brief, weak to strong tornadoes.

Shelf Cloud: No need to report



National Weather Service Milwaukee/Sullivan

Squall Line Tornadoes



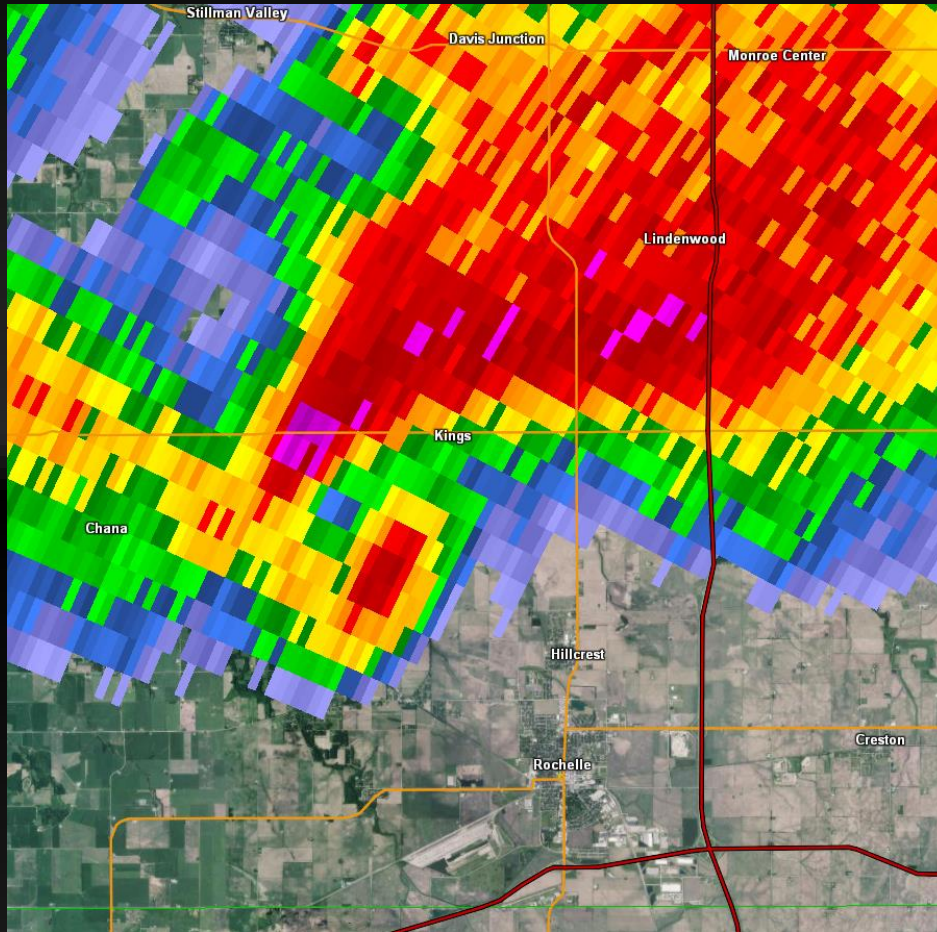
June 17th, 2014 Tornadoes

- Brief, weak to strong tornadoes.
- Difficult to impossible to view.
- Fast moving.
- Embedded within heavy rainfall.
- Typically occur at night.
- Do not try to spot!



National Weather Service Milwaukee/Sullivan

Supercell Thunderstorms



Tom Purdy

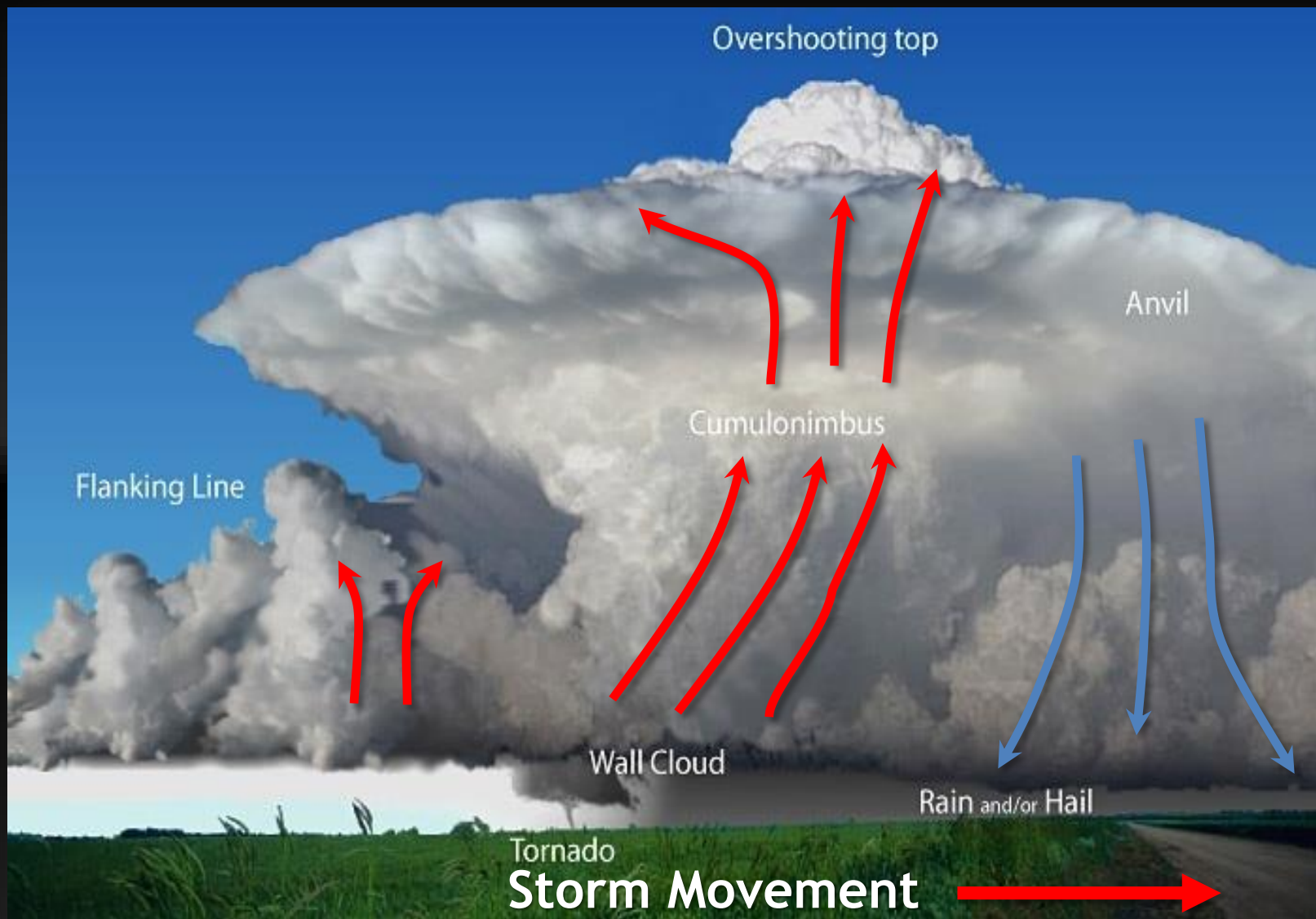


- Strong, long living storm.
- Tornadoes. (Long track)
- Damaging winds. (Downburst)
- Large hail.



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Supercell Thunderstorms



National Weather Service Milwaukee/Sullivan

Supercell Thunderstorms

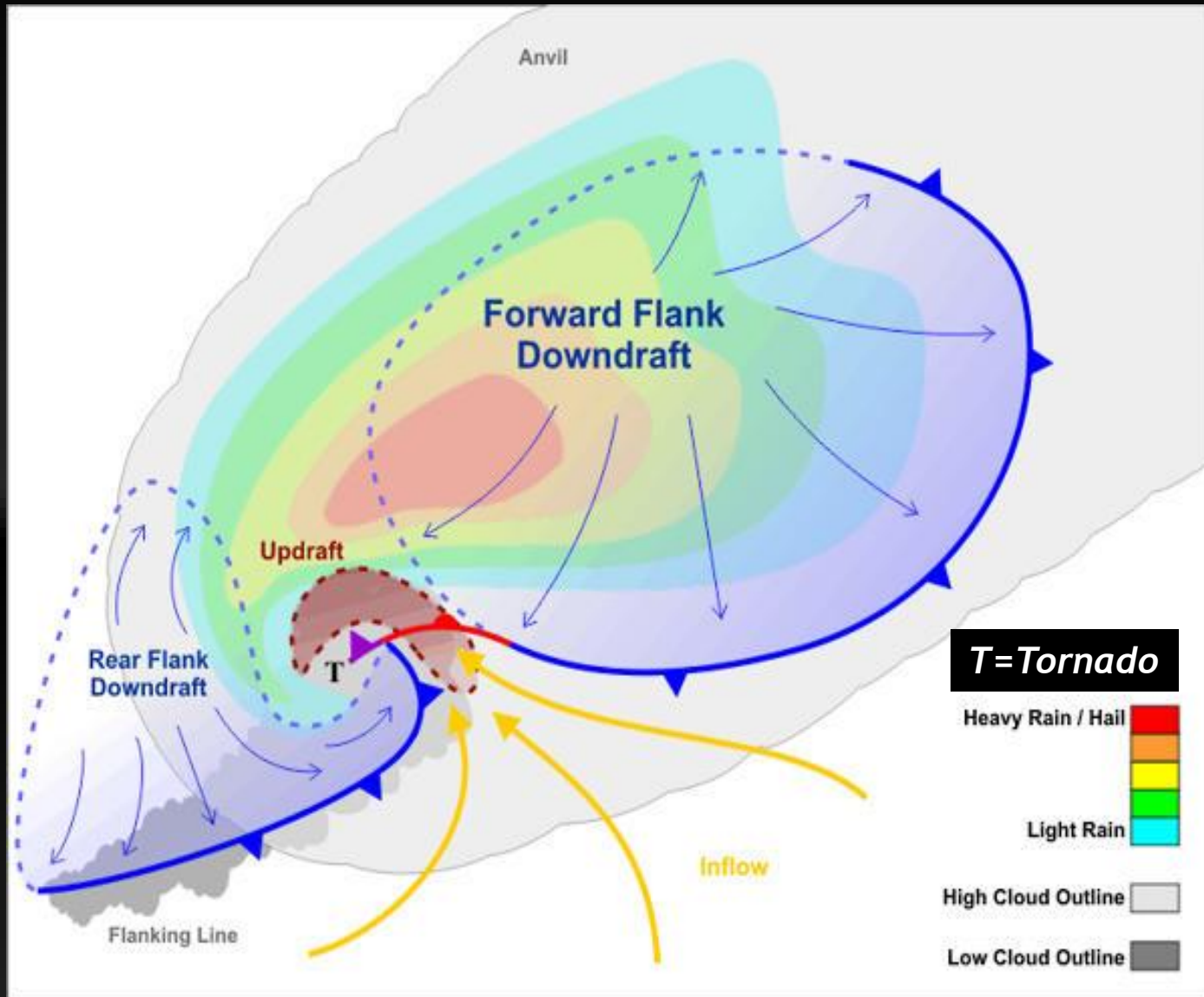


Doug Raflik
Waupun



National Weather Service Milwaukee/Sullivan

Supercell Thunderstorms

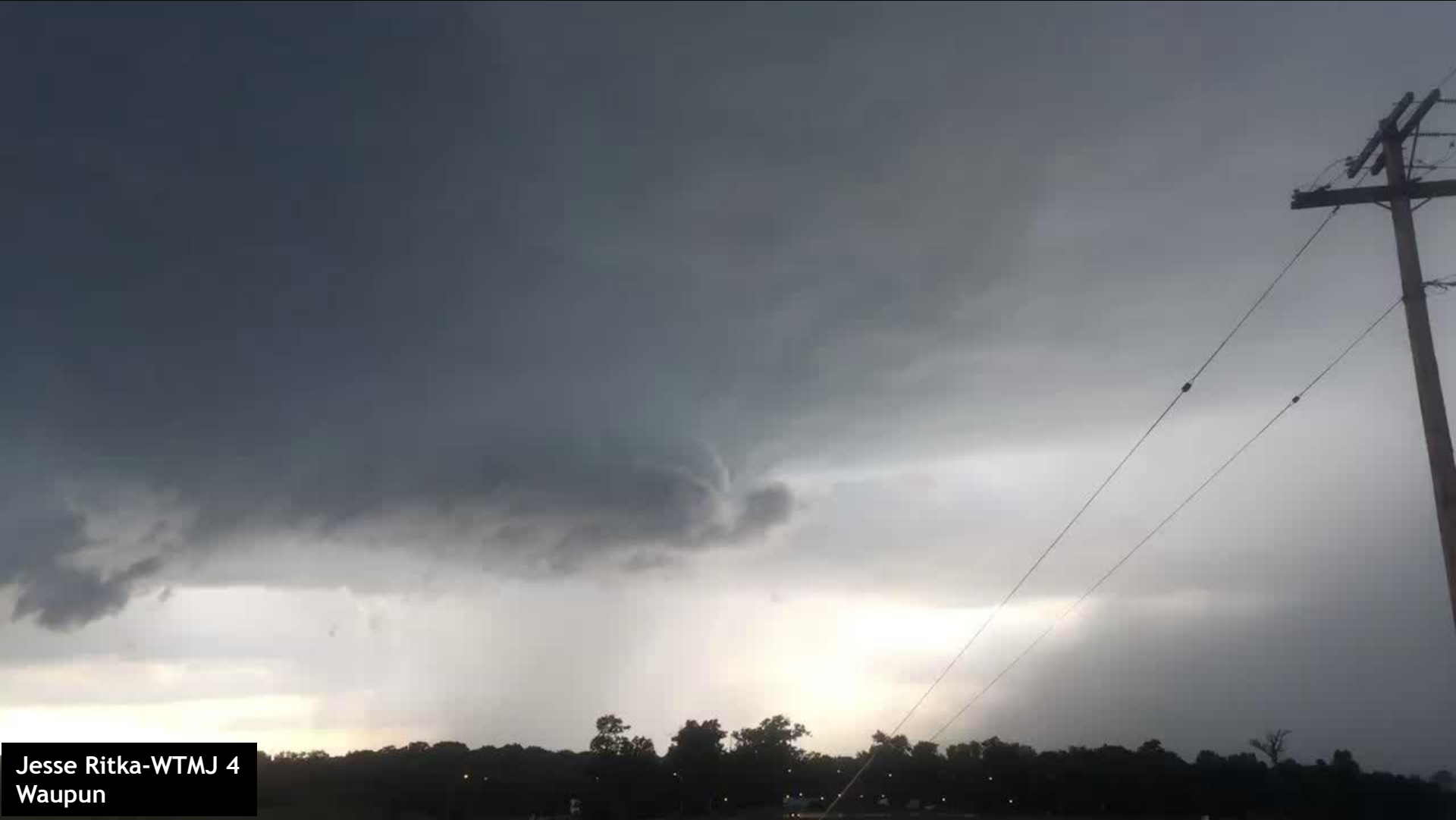


Wall Cloud

- Isolated lowering.
- Rear of storm.
- Updraft area. (up and in)
- Persistent feature?
- Watch for rotation.
- Reportable to NWS.
- **NOTE:**
 - Movement does not equal rotation.
 - Having a wall cloud does not mean a tornado will form.



Wall Cloud



Jesse Ritka-WTMJ 4
Waupun



National Weather Service Milwaukee/Sullivan

Funnel Cloud



Cassie Perkins
Sun Prairie

Rotation at base of cloud.
Reportable to NWS.

*May not trigger a
Tornado Warning



Garrett Latsch
Sun Prairie



Scott Wagner
Sun Prairie



National Weather Service Milwaukee/Sullivan

Tornadoes

While reporting of wind damage, hail, flash flooding are important for the NWS to know of as soon as possible, spotters add the most value with their spotting of tornado formation and prompt reporting directly to the NWS.



National Weather Service Milwaukee/Sullivan

Tornado Behavior

- Typically change direction, intensity and speed over life cycle



National Weather Service Milwaukee/Sullivan

Rain Wrapped Tornado



JW SEVERE WEATHER
WILL WIGHT



National Weather Service Milwaukee/Sullivan

Watch for Debris!



National Weather Service Milwaukee/Sullivan

Nighttime Tornadoes

00;00;00;05

NOT FOR BROADCAST



Brett Adair
Pontiac, IL



National Weather Service Milwaukee/Sullivan

Night Spotting

CAUTION!

- Spotting storms at night can be dangerous!
- Need to be experienced and have radar support!
- Lightning.
- Transformers/Power lines.
 - Bright flashes.
- Roaring sound.
 - Tornado.
 - High Wind.



Tornado Look-a-likes: Virga



National Weather Service Milwaukee/Sullivan

Tornado Look-a-likes: Rain Shaft



National Weather Service Milwaukee/Sullivan

Tornado Look-a-likes: Scud Cloud



Mike Jones
Mt. Pleasant



Kirsahn Mitchell
Kenosha



Geoff Grace
Kenosha/Racine



National Weather Service Milwaukee/Sullivan

Tornado Look-a-likes: Scud Cloud



National Weather Service Milwaukee/Sullivan

Storm Spotting Process

Training

Prepare

Deploy

Observe

Communicate



National Weather Service Milwaukee/Sullivan

Communication

- The **MOST** Important step in process!
- Reports must get to the NWS!
- Do not assume we know just because a warning is out.



National Weather Service Milwaukee/Sullivan

Communication

Reporting Basics

- **Who** are you?
 - Trained spotter, law enforcement, etc
- **What** occurred?
- **When** was it?
- **Where** was it?

- Use proper terms
- Be as specific as you can
- Estimate if needed
- How confident are you?
- Location should be an address/lat-lon/intersection
 - Can be miles from city, if unsure
- Follow up, if necessary



Communication

NWS Milwaukee Spotter Phone #
1-800-545-8197

Reports only!

- Highest Priority:
- Tornado
- Flash flooding
 - Roads washed out/closed
- Structural Damage-Winds
- Uprooted trees-Winds
- Hail over 2" in diameter



National Weather Service Milwaukee/Sullivan

Twitter @NWSMKX



- Best way to send reports/pictures to NWS Milwaukee via social media
- Photos are great!
- Mention @NWSMKX and we receive an audible alert on our computer.
- #swiwx okay, but report may be missed
- We are always monitoring, but call if a high priority event
- More info posted from us here during storms.



National Weather Service Milwaukee/Sullivan

facebook.com/NWSMilwaukee

- Photos are great!
- Send a message **(BEST)**, write a post on the page or a post from us.
- We are monitoring, but call if a high priority event.
- More forecast information posted by us before storms occur.

US National Weather Service Milwaukee/Sullivan Wisconsin

Send Message

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Photos

Likes

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Posts

Notes

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Featured For You

Get in touch with US National Weather Service ...

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2017

Learn how

What new

Classes are

MAR 15

Por

Wed

100% response rate

Typically replies within a few hours

Message

Status

Photo/Video

Write something on this Page...

Government Organization in Dousman, Wisconsin

Invite friends to like this Page

Facebook posts do not always reflect the most current information. For current official info, visit: <http://www.weather.gov/mkx>

41,280 Likes

Tom Purdy and 150 other friends like this

About

See All

(262) 965-2074

Typically replies within a few hours

Message Now

www.weather.gov/mkx

Government Organization

Visitor Posts

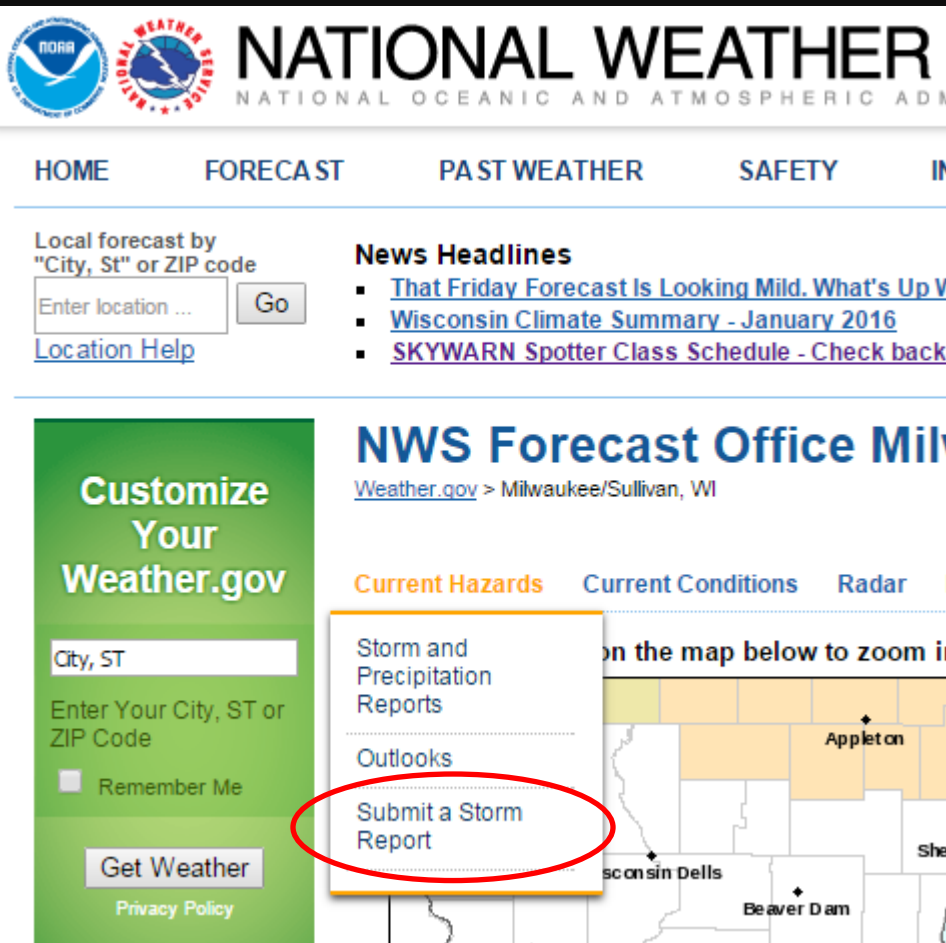
Matt Knorr

February 12 at 3:56pm



National Weather Service Milwaukee/Sullivan

weather.gov/mkx/reports



The screenshot shows the homepage of the National Weather Service Milwaukee/Sullivan office. At the top, there are logos for NOAA and the National Weather Service, followed by the text "NATIONAL WEATHER SERVICE" and "NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION". Below this is a navigation bar with links: HOME, FORECAST, PAST WEATHER, SAFETY, and IN. The main content area is divided into several sections. On the left, there is a "Local forecast by 'City, St' or ZIP code" section with a text input field for "Enter location ..." and a "Go" button. Below this is a "Location Help" link. In the center, there is a "News Headlines" section with three bullet points: "That Friday Forecast Is Looking Mild. What's Up W", "Wisconsin Climate Summary - January 2016", and "SKYWARN Spotter Class Schedule - Check back". To the right of the news headlines is a "NWS Forecast Office Milwaukee/Sullivan" section with a link to "Weather.gov > Milwaukee/Sullivan, WI". Below this is a "Current Hazards" section with a link to "Current Conditions" and a "Radars" link. On the far left, there is a green sidebar with the text "Customize Your Weather.gov" and a "City, ST" input field. Below this is a "Remember Me" checkbox and a "Get Weather" button. At the bottom of the sidebar is a "Privacy Policy" link. A red circle highlights the "Submit a Storm Report" link in the "Current Hazards" section.

Submit a Storm Report

This interface is intended to be used solely for the relay of storm information to the NWS. Other comments or information should be sent to the [National Weather Service Milwaukee/Sullivan, Wisconsin](#).

Event Location

Enter date/time/location of event. Please reference to major roadway or intersection for events within towns/cities.

Event Time:	12	30	PM	<input type="radio"/> Central
Event Date:	Feb	16	2016	
County:	--Select a County--			
Location (7 NW Mytown):				

Event Type (Select all that apply)

Click box next to events you observed. Next, select appropriate sub-descriptor in pull down menus to describe event.

<input type="checkbox"/> Dense Fog	--Select Category--	
<input type="checkbox"/> Flood	--Select a flooding category--	
<input type="checkbox"/> Hail	--Select a Hail size--	
<input type="checkbox"/> High Wind Speed	--Select a Wind speed--	
<input type="checkbox"/> Tornado/Funnel Cloud	--Select a report--	
<input type="checkbox"/> Wind Damage	--Select a Wind Damage Desc	
<input type="checkbox"/> Snow	--Select a snow total--	--Select a duration--
<input type="checkbox"/> Freezing Rain/Icing	--Select an ice total--	--Select a duration--
<input type="checkbox"/> Heavy Rain	--Select a rainfall total--	--Select a duration--

Additional Details

Provide any additional information that you feel is pertinent to your submission (600 characters max).

You may also pass along additional information by [e-mailing](#) them to the Milwaukee/Sullivan, Wisconsin separately. (NWS MKX)

Contact Information

VOLUNTARY and **WILL NOT** be distributed.

Your Name:	<input type="text"/>
Spotter Id:	<input type="text"/>
E-mail address:	<input type="text"/>
Phone number:	<input type="text"/>
Observer Profile:	--Select a Profile--

*At minimum,
please select
NWS Storm
Spotter*



National Weather Service Milwaukee/Sullivan

Amateur Radio

Columbia County ARES/RACES Richard Green: kc9fnm@gmail.com Tyler Letlebo: tletlebo@gmail.com	Dane County Midwest SSTRC Dale Bernstein: dale.bernstein@midwestsstrc.org	Dodge County ARES/RACES Ryan Klavekoske: ryantiff@charter.net	Fond du Lac County Sullivan Committee webmaster@sulcom.info
Green County Sullivan Committee webmaster@sulcom.info	Green Lake County Sullivan Committee webmaster@sulcom.info	Iowa County ARES/RACES Brad Holcomb: brad.sulcom@brokennexus.com Dale Bernstein: dale.bernstein@midwestsstrc.org	Jefferson County ARES/RACES Paul Marowsky: paul@marowsky.com
Kenosha County Racine Co ARES/RACES Dave Whitham: vacuumtube.guru@gmail.com	Lafayette County Sullivan Committee webmaster@sulcom.info	Marquette County ARES/RACES Gary Sorensen: garyso@maqs.net	Milwaukee County Milwaukee Area Skywarn Association Skip Voros: savoros@execpc.com
Ozaukee County OZARES ARES/RACES Don Zank: d_zank@yahoo.com	Racine County ARES/RACES Dave Whitham: vacuumtube.guru@gmail.com	Rock County Midwest SSTRC Dale Bernstein: dale.bernstein@midwestsstrc.org	Sauk County ARES/RACES Matt Noll: kc9upe@gmail.com
Sheboygan County OZARES/Washington County ARES/RACES	Walworth County Weather Spotters Chad Anderson: k9cma71@gmail.com Eli Larson: k9ilj.wx@gmail.com	Washington County ARES/RACES Steve Sundquist: realsnow@hotmail.com	Waukesha County MASA Skip Voros: savoros@execpc.com

mPING

U.S. Cellular 3G 1:48 PM 89%

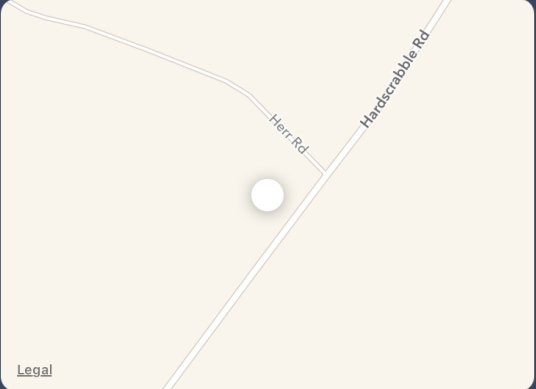
The mPING Project

Meteorological Phenomena Identification Near the Ground

Report Type Definitions




Select Report Type

Current Location



Legal

Submit Report *i*

   View Reports

U.S. Cellular LTE 10:18 AM 95%

< Back Report Types

Test

None

Rain/Snow

Hail

Wind Damage

Tornado

Flood

Mudslide

Reduced Visibility

U.S. Cellular LTE 10:18 AM 95%

< Report Types Report Types

Pea (0.25 in.)

Half-inch (0.50 in.)

Dime (0.75 in.)

Quarter (1.00 in.)

Half Dollar (1.25 in.)

Ping Pong Ball (1.50 in.)

Golf Ball (1.75 in.)

Hen Egg (2.00 in.)

Hen Egg+ (2.25 in.)

Tennis Ball (2.50 in.)



National Weather Service Milwaukee/Sullivan

KMKX Milwaukee
VCP 32: Clear Air Mode

1

er Network



AirDrop. Share instantly with people nearby. If they turn on AirDrop from Control Center on iOS or from Finder on the Mac, you'll see their names here. Just tap to share.



Message



Mail



Add to Notes



Twitter



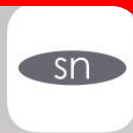
Copy



Save Image

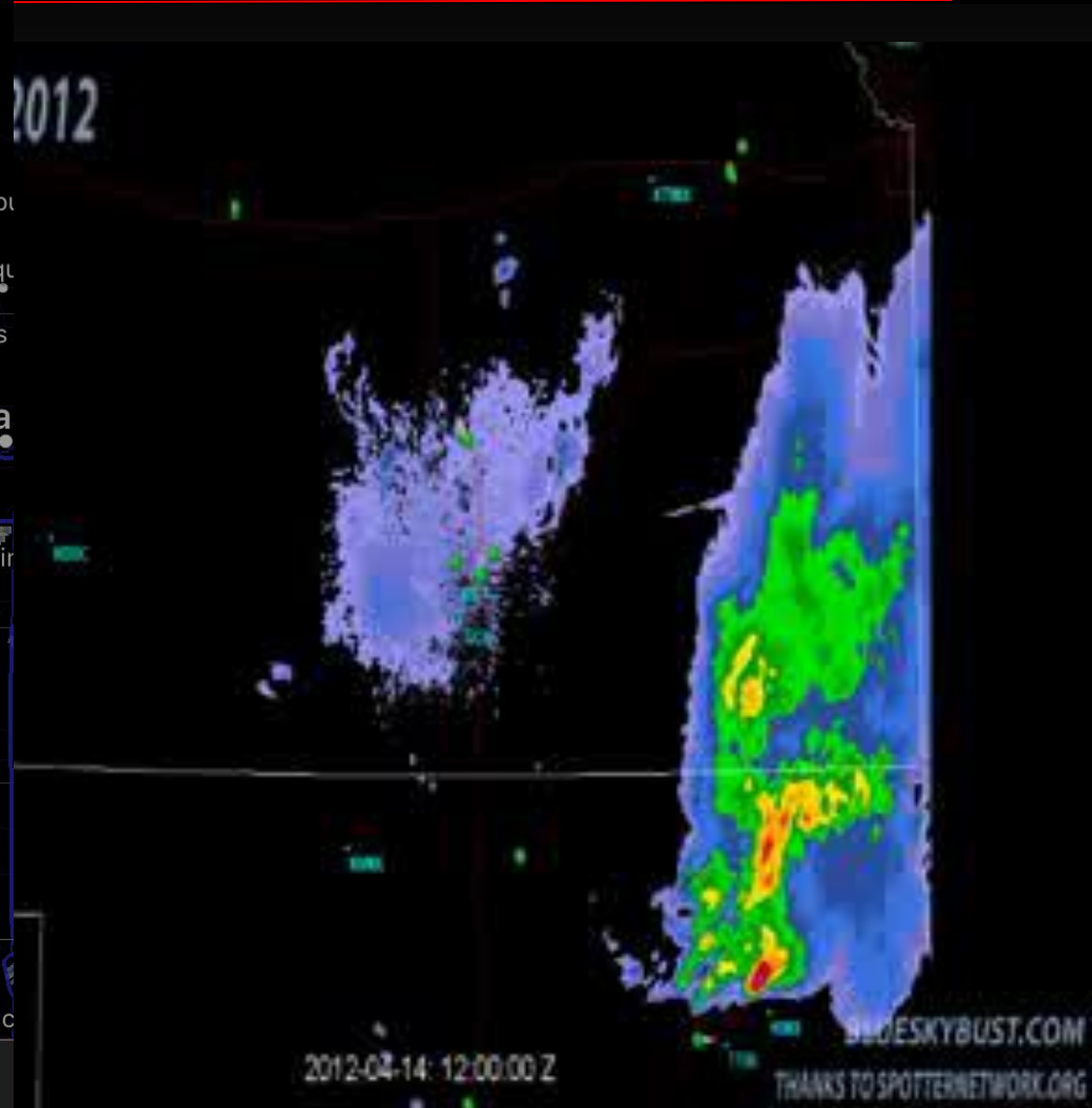


mPING
Report



Spotter
Report

Cancel



her Service Milwaukee/Sullivan

Community Collaborative Rain, Hail, & Snow Network

Enter My New Reports

- [Daily Precipitation](#)
- [Multi-Day Accumulation](#)
- [Hail](#)
- [Significant Weather](#)
- [Monthly Zeros](#)
- [Drought Impact Report](#)

FROST Reports

- [Frost](#)
- [Optics](#)
- [Snowflake](#)
- [Thunder](#)



National Weather Service Milwaukee/Sullivan

How to report: Tornadoes

- Call NWS Milwaukee directly: **1-800-545-8197**
- Amateur Radio: WX9MKX
- If safe, send picture via Twitter/Facebook
 - Could have a lag in communication
- Do NOT call 911!
- Stay in contact with office:
 - Is it still on the ground?
 - What direction is it from your location?
 - How confident are you in what you are seeing?
 - Any damage? If so, to what?
 - Contact information



National Weather Service Milwaukee/Sullivan

How to report: Wall/Funnel Cloud

- Call NWS Milwaukee directly: **1-800-545-8197**
- Amateur Radio: WX9MKX
- Send picture via Twitter/Facebook
- Do NOT call 911!
- Stay in contact with office:
 - Strong rotation?
 - Any debris under it?
 - What direction is it from your location?
 - How confident are you in what you are seeing?
 - Do NOT report scud or shelf cloud!



National Weather Service Milwaukee/Sullivan

How to report: Wind Damage

Structural damage or uprooted trees?

- Call NWS Milwaukee directly: **1-800-545-8197**
- Amateur Radio: WX9MKX
- Do NOT call 911!



Other damage for 40-70mph winds

- Send report/picture via Twitter/Facebook/Website
- Measured wind gusts are a plus!
 - Get a weather station!
- Is it a full tree that is down or just parts of it?
- Under 40mph or no damage? No need to report.



National Weather Service Milwaukee/Sullivan

How to report: Hail

Over 2" (Lime) Diameter Hail?

- Call NWS Milwaukee directly: **1-800-545-8197**
- Amateur Radio: WX9MKX
- Send report/picture via Twitter/Facebook/website/mPING
- Do NOT call 911!



Less than 2" Diameter Hail?

- Twitter/Facebook/website/mPING
- Take picture of largest hail stones in front of ruler or object



How to report: Flash Flooding

Roads washed out or closed. Rainfall rates of 3" per hour or more?

- Call NWS Milwaukee directly: **1-800-545-8197**
 - Amateur Radio: WX9MKX
 - Send report/picture via Twitter/Facebook/website
 - Do NOT call 911!
-
- Measure rain and how long it fell.
 - Urban flooding?



National Weather Service Milwaukee/Sullivan

Safety

- Your safety is a #1 priority!
- It is your responsibility to stay safe
- Obey federal, state, local laws, and directives from public safety officials
- Do not put yourself (or others) in harms way



National Weather Service Milwaukee/Sullivan

Safety

- Awareness
- Communicating whereabouts
- Escape Routes
- Safe zones/shelters



National Weather Service Milwaukee/Sullivan

Thank you for attending!
Questions?
Timothy.J.Halbach@noaa.gov

